IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Confirmation No.: 4785
SALA *et al.*	Art Unit: 2667
Application No.: 09/783,404	Examiner: Hoang, Thai D.
Filed: February 15, 2001	Atty. Docket: 1875.0440002
For: **Method, System And Computer Program Product For Scheduling Upstream Communications**	

Brief on Appeal Under 37 C.F.R. § 41.37

Mail Stop Appeal Brief - Patents

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

A Notice of Appeal from the final rejection of claims 1-10 was filed on October 4, 2005. Appellants hereby file one copy of this Appeal Brief, together with the required fee set forth in 37 C.F.R. § 41.20(b)(2).

It is not believed that extensions of time are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any fees required therefor (including fees for net addition of claims) are hereby authorized to be charged to our Deposit Account No. 19-0036.

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I. Real Party In Interest (37 C.F.R. § 41.37(c)(1)(i))

The real party in interest is Broadcom Corporation, having its principal place of business at 16215 Alton Parkway, Irvine, California, 92618-3636. An assignment assigning all right, title, and interest in and to the patent application from the inventors to Broadcom was recorded in the U.S. Patent & Trademark Office on July 24, 2001, at Reel 012004, Frame 0431.

II. Related Appeals and Interferences (37 C.F.R. § 41.37(c)(1)(ii))

To the best knowledge of Appellants, Appellants' legal representative, and Appellants' assignee, there are no other appeals or interferences which will directly affect or be directly affected or have a bearing on a decision by the Board of Patent Appeals and Interferences ("the Board") in the pending appeal.

III. Status of Claims (37 C.F.R. § 41.37(c)(1)(iii))

This application was originally filed as U.S. Application No. 09/783,404 on February 15, 2001 with 10 claims. In an Office Action mailed September 08, 2004, claims 1-10 were rejected. In the Amendment and Reply filed on December 08, 2004, Appellants amended claim 1 to correct informal or typographical errors. The pending claims 1-10 were finally rejected in a Final Office Action mailed April 04, 2005 ("Final Office Action"). In response, Appellants filed a Reply on July 05, 2005. The Advisory Action mailed on August 04, 2005 ("Advisory Action"), maintained the rejection of claims 1-10. No claim stands allowed. A Notice of Appeal was timely filed October 04, 2005. Claims 1-10 are on appeal. A copy of the claims on appeal can be found in the attached Claims Appendix as required under 37 C.F.R. § 41.37(c)(1)(viii).

IV. Status of Amendments (37 C.F.R. § 41.37(c)(1)(iv))

The Final Office Action failed to acknowledge Appellants' amendment filed December 08, 2004 in response to the Office Action mailed September 08, 2004. No further amendment has been filed by Appellants subsequent to the Examiner's Final Rejection mailed April 04, 2005. Nevertheless, Appellants have prepared this appeal brief with the understanding that the amendments were entered.

V. Summary of Claimed Subject Matter (37 C.F.R. § 41.37(c)(1)(v))

The claimed invention provides a method for scheduling transmissions for a plurality of services operating over a distributed communications network. The network has at least one remote node (e.g. a headend communication device) and one or more local nodes (e.g. cable modems). Accordingly, in one embodiment, each cable modem in the system contains a local scheduler that sends requests for bandwidth to a headend communications device. Upon receipt of a grant from the headend communications device, the local scheduler selects packets to be transmitted to best serve the needs of the services associated with the cable modem. Accordingly, a service requesting bandwidth may not be the service utilizing the grant corresponding to the original bandwidth request. The local scheduler manages bandwidth allocation among its local services such that all requesting services eventually receive bandwidth.

Independent claim 1 recites a distributed communications network (Specification, p. 7, lines 1-19, FIG. 1) having at least one remote node (Specification, p. 7, lines 7-8, element 102 in FIG. 1) and one or more local nodes (Specification, p. 7, line 8, element 104 in FIG. 1), each local node providing one or more services and at least one local node having a local scheduler (Specification, p. 9, lines 23-24, element 114 in FIG. 1), a method for managing upstream communications from the local scheduler, comprising the steps of: (a) sending a request to transmit data related to a requesting service (Specification, p. 10, lines 25-27, element 208 in FIG. 2); (b) receiving a grant specification from a remote node, said grant specification providing authorization to transmit data related to the requesting service (Specification, p. 11, lines 3-4, element 212 in FIG. 2); (c) considering the needs of a

plurality of services, said plurality of services including the requesting service and at least one other service (Specification, p. 11, lines 4-12, element 216 in FIG. 2); (d) scheduling packets for said plurality of services in response to said considering step (Specification, p. 11, lines 13-28 to p.13, lines 1-4, element 220 in FIG. 2); and (e) transmitting a burst based on the scheduled packets to the remote node (Specification, p. 13, lines 5-7, element 224 in FIG. 2).

VI. Grounds of Rejection to be Reviewed on Appeal (37 C.F.R. § 41.37(c)(1)(vi))

In the Final Office Action, claims 1-8 and 10 were rejected under 35 U.S.C. §102(e) as being anticipated by Lyles. Claim 9 was rejected under 35 U.S.C. §103(a) as being unpatentable over Lyles.

Accordingly, the grounds of rejection to be reviewed on appeal are:

A. Rejection of claims 1-8 and 10 under 35 U.S.C. §102(e) as being anticipated by Lyles.

B. Rejection of claim 9 under 35 U.S.C. §103(a) as being unpatentable over Lyles.

VII. Argument (37 C.F.R. § 41.37(c)(1)(vii))

Appellants recognize that any claim that depends from a patentable independent claim is patentable at least by virtue of its dependency. In addition, claims 2-10, which depend from claim 1 are patentable not only in view of their dependencies, but also by virtue of their specifically recited features.

A. Rejection of claims 1-8 and 10 under 35 U.S.C. §102(e) over Lyles

In the Final Office Action, the Examiner rejected claims 1-8 and 10 under 35 U.S.C. §102(e) as allegedly being anticipated by Lyles.

To establish anticipation under §102, the Examiner must show that "each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Verdegaal Bros. v. Union Oil of California, 814 F.2d 628, 631 (Fed. Cir. 1987). Because the Examiner has failed to establish that each and every element is described in Lyles, the rejection of claims 1-8 and 10 must be reversed.

Claim 1

On page 3 of the Final Office Action, the Examiner states:

> In addition, Lyles teaches that the apparatus supports multiple quality of services (QoS) and class of services (CoS) (col. 7, lines 7-9; col. 8, lines 44-48). ***Therefore, it indicates that the scheduler located at NAU 315 performs the step of calculating the needs of a plurality of services that includes the requesting of the plurality of CoS and/or QoS; and then the scheduler performs the step of scheduling for transmitting plurality of CoS data packets to the head-end 105.***

However, as discussed in Appellants' Reply to Final Office Action filed on July 05, 2005, and the Amendment and Reply filed December 08, 2004, Lyles does not disclose each and every element and/or feature of claims 1-10. For example, with respect to independent claim 1, Lyles does ***not*** disclose a method for "managing upstream communications ***from the local scheduler***" that comprises any of the following:

> (c) ***considering the needs of a plurality of services***, said plurality of services including the requesting service and at least one other service;
> (d) ***scheduling*** packets for said plurality of services ***in response to said considering step***; and
> (e) transmitting a burst based on the scheduled packets to the remote node.

(as recited in independent claim 1, emphasis added). Lyles, on the contrary, describes a shared-media network in which ***any*** downstream and upstream ***scheduling is executed by its head-end controller 105*** (or other bandwidth allocation unit 305). (Lyles, col. 8, lines 35-37 and lines 44-51). The Examiner has interpreted the Lyles reference out of context. For example, on page 3 of the Final Office Action the Examiner applies column 7, lines 7-9 of Lyles to teach elements of independent claim 1. According to Lyles:

> Further, the inventive scheme supports multiple quality of service (QoS) classes via mechanisms which give highest priority to the service class with the most stringent QoS requirements.

(*See* Lyles at column 7, lines 6-9). However, Lyles refers to the support of multiple QoS in context of the Bandwidth Allocation Unit (BAU) 305 and ***not*** the Network Access Unit (NAU) 315. For example, in the same paragraph as the above quotation, Lyles describes:

> Specifically, the inventive method manipulates ***requests for transmission bandwidth received by a bandwidth allocation unit from a network access unit***, converting the arriving

> requests into virtual scheduling times for granting access to the shared media.

(*See* Lyles at column 7, lines 2-6.) The passages identified by the Examiner as describing multiple quality of services and class of services (i.e., col. 7, lines 7-9; col. 8, lines 44-48) actually ***describes the function of the head-end controller 105 (or other BAU 305)***, as previously discussed. Thus, Lyles does ***not*** teach or even suggest managing upstream communications ***from the local scheduler***. The Examiner has erroneously interpreted the Lyles reference.

On page 3 of the Final Office Action, the Examiner also cites column 8, lines 44-48 of Lyles as teaching the features of independent claim 1. According to Lyles:

> Referring to the data flow diagram in FIG. 4, ***the method, executed by the head-end controller 105 (or other bandwidth allocation unit 305)***, comprises:
>
> (a) receiving a transmission authorization request 405 [4] from an identified terminal equipment 210 as illustrated in Lines 517 through 519 of FIG. 5 the transmission authorization request 405 being associated with a requested transmission;
>
> (b) generating a virtual scheduling time [5] for the requested transmission, based on (1) the time of arrival of the transmission authorization request 405 [6], (2) a class of service associated with the transmission authorization request 405 [7], and (3) a virtual scheduling time of a previous transmission authorization request 405 made on behalf of the identified terminal equipment 210 [8].

(*See* Lyles at col. 8, lines 35-51, emphasis added). The Examiner's rejection of claim 1 is premised on an erroneous interpretation of the above passage from Lyles. Once again, the Examiner has misconstrued the steps performed by head-end controller 105 (or BAU 305) to be performed by terminal equipment 210 (or NAU 315). At no place does

Lyles teach or suggest that the scheduler (or any other component) within NAU 315 may utilize a grant for any service other than the "requested transmission."

Contrary to Lyles' description, Appellants' claim 1 permits a flexible use of grants (see Appelants' specification, p. 11, line 13 to p. 12, line 18). Referring back to claim 1, when the local scheduler receives a grant specification, the local scheduler has the flexibility to decide whether to utilize the grant specification for the requesting service or for another service by "considering the needs of a plurality of services". Lyles provides no description of steps performed by NAU 315 that include "considering the needs of a plurality of services" or "scheduling packets for said plurality of services in response to said considering step" as recited in independent claim 1. Therefore, Lyles cannot teach Appellants' invention, as recited in independent claim 1.

In the response to Appellants' arguments to the Final Office Action, the Examiner states in the Advisory Action:

> Page 7 of the remarks, Applicants argue that "[A]t no place does Lyles teach or suggest that the scheduler (or any other component) within NAU 315 may utilize a grant for any service other than the "requested transmission". Examiner respectfully disagrees. Applicants are directed to fig. 4, col. 10, lines 44-65, wherein the reference discloses the system allocates bandwidth for data packets based on both requesred (*sic*)and non-requested transmission. It, therefore, indicates that the reference clearly teaches the step of "considering the needs of a plurality of services, said plurality of services including the requesting service and at least one other service" as recited in claim 1.

However, according to the portion of Lyles cited by the Examiner:

> [7] The term "class of service" refers to a group of data flows that receive similar treatment with respect to allocation of loss and delay. (See the definitions in the Background section). The class of service factor may be used to select an

> algorithm for generating the virtual scheduling time, e.g., weighted fair queuing or round-robin.
>
> In some implementations, only a single class of service may exist. For example, legacy systems such as past implementations of the Internet may have had a single class of service without ever referring to the class of service as such; modern terminology and the emergence of multiple class-of-service networks, however, are retroactively labeling such networks as having a single class of service.
>
> ***[8] The previous request 405 can be either an explicit request or an implicit request as previously discussed. The previous request is made on behalf of the terminal equipment 210, which often (but not always) means that it was made by the terminal equipment 210 itself.*** If no previous request exists, then the terminal equipment 210 can transmit a request either 1) in response to a direct poll by the head-end controller 105 (or other bandwidth allocation unit 305), or 2) via contention mechanism.

(*See* Lyles at column 10, lines 44-65, emphasis added). Once again, Lyles describes that the request 405 is made by terminal equipment 210 and access to an upstream channel is granted by head-end controller 105. The implicit requests taught by Lyles are further described by Lyles as:

> In addition to explicit requests 405 for bandwidth from a terminal equipment 210, the inventive method and (*sic*) accommodate ***implicit request generated automatically at the head-end controller in accordance with previous negotiation between the head-end controller 150 and terminal equipment 210.***

(*See* Lyles at column 10, lines 20-25). Lyles clearly states that explicit requests 405 for bandwidth are received by head-end controller 105 from terminal equipment 210 and implicit requests are generated automatically by the head-end controller. Accordingly, Lyles fails to teach or suggest "a method for managing upstream communications from the local scheduler" that includes the steps of "considering the needs of a plurality of services", "scheduling packets for said plurality of services in response to said considering step" and

"transmitting a burst based on the scheduled packets to the remote node" as recited in independent claim 1.

Accordingly, claim 1 is patentable over Lyles for at least the reason that Lyles does not teach each and every feature of claim 1.

Claim 4

Claim 4 recites:

> 4. A method of claim 1, further comprising the step of drawing data from a higher priority queue prior to drawing data from a lower priority queue ***to implement said scheduling packets***. (emphasis added)

On page 4 of the Final Office Action, the Examiner states:

> Regarding claim 4, Lyles discloses that the system processes a plurality of class of services data queues. It, therefore, inherently processes data from a higher priority queue to a lower priority queue.

However, Lyles describes:

> This idea can be extended to include requests from a network access unit 315 consisting of a batch of transmission requests; one request for each packet to be transmitted. ***Further, requests can be made either in terms of a rate (e.g., "please give me 100 packets-per-second"), or in terms of a burst (e.g.,, "I have 20 packets queued up ready to send").*** In addition, a request may contain a single information element which represents an aggregation of individual queued transmission requests (e.g., ***a single summary request representing the request status of the collection of transmission queues at the network access unit***); or a request may contain multiple information elements, a batch which represents a burst size worth of requests over one or more transmission queues at the network access unit. The implementation for either scheme in the bandwidth allocation unit can use a simple counter per network access unit which is incremented when a request is received by the bandwidth

> allocation unit and decremented when an authorization grant is issued by the bandwidth allocation unit.

(*See* Lyles at column 7, lines 24-42, emphasis added.) Appellants respectfully submit that Lyles teaches ***bandwidth requests*** by NAU 315 based on request status of transmission queues and does not teach or suggest ***scheduling of packets*** after receiving requested bandwidth from a head-end device. Thus Lyles fails to teach or suggest "drawing data from a higher priority queue prior to drawing data from a lower priority queue ***to implement said scheduling packets***" as recited in claim 4 (emphasis added). Accordingly, claim 4 is patentable over Lyles for at least the reason that Lyles does not teach each and every feature of claim 4.

Claims 5-8 and 10

On page 4 of the Final Office Action, the Examiner states:

> Regarding claims 5-8 and 10, Lyles teaches that the NAU 315 sends one or multiple bandwidth requests, which are located in slots of an upstream channel, to the BAU 305; col 6, line 61-col. 7, line 4; col. 7, lines 30-37; col. 12, lines 45-62.

Appellants respectfully submit that the portions of Lyles cited by the Examiner fail to teach or suggest each and every feature of claims 5-8 and 10. For example, Lyles describes:

> In addition, a request may contain a single information element which represents an aggregation of individual queued transmission requests (e.g., a single summary request representing the request status of the collection of transmission queues at the network access unit); or ***a request may contain multiple information elements, a batch which represents a burst size worth of requests over one or more transmission queues at the network access unit.***

(*See* Lyles at column 7, lines 30-37, emphasis added.) Thus Lyles describes aggregating bandwidth requests in a "burst size worth of requests" from a NAU 315 to a BAU 305 but does ***not*** describe piggybacking or the same steps for sending bandwidth requests as recited in claims 5-8 and 10. For example, Lyles fails to teach or suggest "sending a ***piggyback bandwidth request*** with the burst" as recited in claim 5 or "sending ***multiple piggyback bandwidth requests*** with the burst" as recited in claim 10 (emphasis added). Lyles also fails to teach or suggest "***appending said piggyback bandwidth request to the burst***" as recited in claim 6 (emphasis added). Furthermore, Lyles fails to teach or suggest "***appending said piggyback bandwidth request to a voice packet***" as recited in claim 7 or "***sending said piggyback bandwidth request as a message***" as recited in claim 8 (emphasis added). Accordingly, claims 5-8 and 10 are patentable over Lyles for at least the reason that Lyles does not teach each and every feature of claims 5-8 and 10.

B. Rejection of claim 9 under 35 U.S.C. §103(a) over Lyles

In the Final Office Action, the Examiner rejected claim 9 under 35 U.S.C. §103(a) as being unpatentable over Lyles.

In proceedings before the Patent and Trademark Office, the Examiner bears the burden of establishing a prima facie case of obviousness based on prior art. In re Piasecki, 745 F.2d 1468, 1471-73, 223 USPQ (BNA) 785, 787-88 (Fed. Cir. 1984). To establish a prima facie case of obviousness, three criteria must be met. First, some motivation or suggestion must exist in the reference or in the knowledge generally available to one of ordinary skill in the art to modify the reference. In re Vaeck, 947 F.2d 488, 493, 20 USPQ 1438, 1443 (Fed. Cir. 1991). Second, the reference must reveal a reasonable expectation of

success. Id. Finally, the reference must teach or suggest all the claim limitations. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Because the Examiner has failed to establish all of these criteria, the rejection of claim 9 must be reversed.

Claim 9

On page 4 of the Final Office Action, the Examiner states:

> Regarding claim 9, Lyles does not disclose the bandwidth request is sent in the header frame. However, one of ordinary skill in the art would be able to modify Lyles's system by sending the bandwidth request in a header frame. It would have been obvious to one of ordinary skill in the art at the time the invention was made to send the request bandwidth in the header frame in order to save the bandwidth of the system.

Appellants respectfully submit that nowhere does Lyles teach or suggest "sending said piggyback bandwidth request in a header frame" as recited in claim 9 and the Examiner fails to point out where Lyles teaches all the limitations of claim 9. Appelants respectfully submit that the Examiner has used impermissible hindsight in making the rejection of claim 9. MPEP 2141.

The Examiner has not met the burden required to maintain a *prima facie* case of obviousness with respect to claim 9 for at least the reason that Lyles does not teach each and every feature of Appellants' claim 9. Accordingly, the rejection of claim 9 under 35 U.S.C. § 103(a) is improper and should be reversed.

C. Conclusion

The subject matter of claims 1-10 is patentable over the cited art because the Examiner has failed to show that each and every feature of the claimed embodiments is

taught in the cited references. Therefore, Appellants respectfully request that the Board reverse the Examiner's final rejection of these claims under 35 U.S.C. §§ 102(e) and 103(a) and remand this application for allowance and issue

Respectfully submitted,

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VIII. Claims Appendix

1. (*previously presented*) In a distributed communications network having at least one remote node and one or more local nodes, each local node providing one or more services and at least one local node having a local scheduler, a method for managing upstream communications from the local scheduler, comprising the steps of:

(a) sending a request to transmit data related to a requesting service;

(b) receiving a grant specification from a remote node, said grant specification providing authorization to transmit data related to the requesting service;

(c) considering the needs of a plurality of services, said plurality of services including the requesting service and at least one other service;

(d) scheduling packets for said plurality of services in response to said considering step; and

(e) transmitting a burst based on the scheduled packets to the remote node.

2. (*original*) A method of claim 1, further comprising the step of evaluating the current state of queues for each of said plurality of services.

3. (*original*) A method of claim 1, further comprising the step of evaluating at least one of throughput and latency to consider the needs of said plurality of services.

4. (*original*) A method of claim 1, further comprising the step of drawing data from a higher priority queue prior to drawing data from a lower priority queue to implement said scheduling packets.

5. (*original*) A method of claim 1, further comprising the step of sending a piggyback bandwidth request with the burst.

6. (*original*) A method of claim 5, further comprising the step of appending said piggyback bandwidth request to the burst.

7. (*original*) A method of claim 6, further comprising the step of appending said piggyback bandwidth request to a voice packet.

8. (*original*) A method of claim 5, further comprising the step of sending said piggyback bandwidth request as a message.

9. (*original*) A method of claim 5, further comprising the step of sending said piggyback bandwidth request in a header frame.

10. (*original*) A method of claim 1, further comprising the step of sending multiple piggyback bandwidth requests with the burst

IX. Evidence Appendix

None.

X. Related Proceedings Appendix

None.